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Gas Journal

VOL. 297. 111th YEAR. LONDON, JANUARY 28, 1959 No 4985 PRICE 1/6

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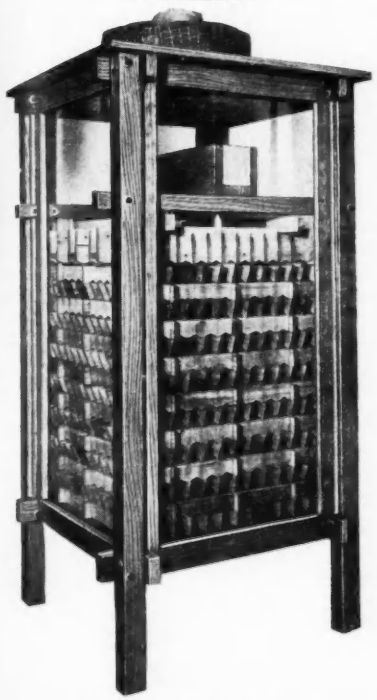

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Gas Journal

VOL. 297 NO. 4985 JANUARY 28, 1959

111TH YEAR

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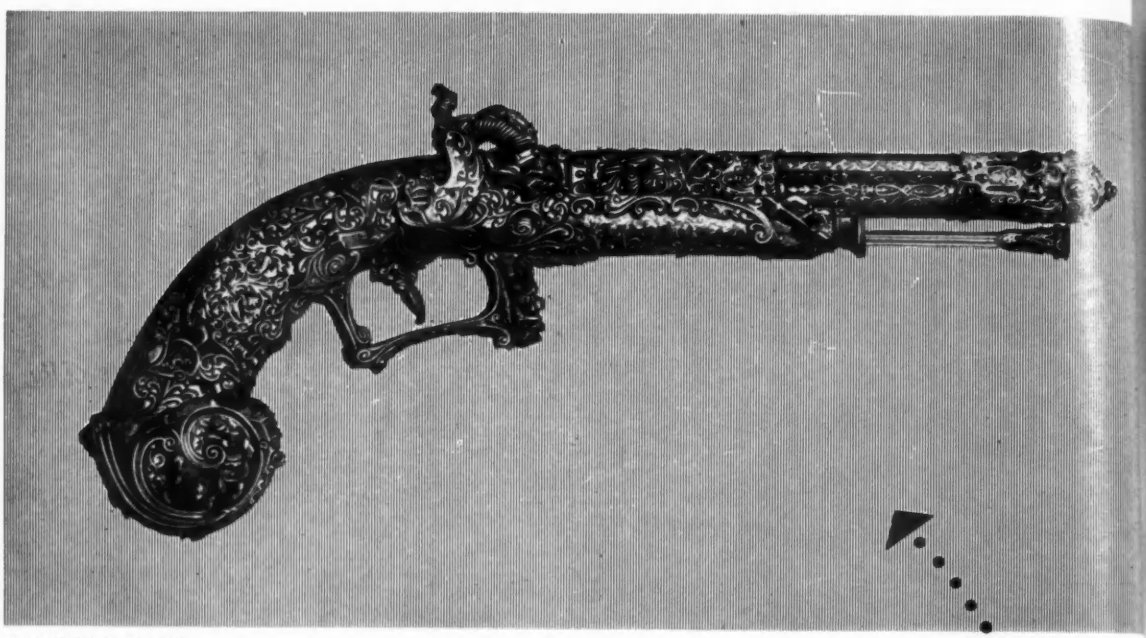

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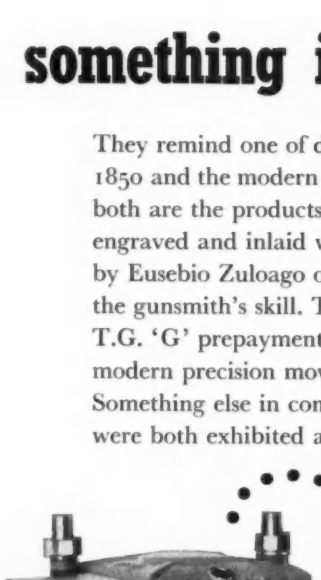
something in common

They remind one of different worlds, the Spanish forged iron pistol of 1850 and the modern T.G. meter. Yet, they have something in common — both are the products of true craftsmanship. The pistol delicately engraved and inlaid with damascene, designed and made by Eusebio Zuloago of Madrid, is presented as a fine example of the gunsmith's skill. The T.G. meter epitomizes craftsmanship and the T.G. 'G' prepayment mechanism is accepted as the most modern precision movement on the market.
Something else in common, this Spanish pistol and a T.G. meter were both exhibited at the Great Exhibition of 1851.



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Gas Journal

VOLUME 297. No. 4985 JANUARY 28, 1959. 111th YEAR

Electricity and the Station Engineer

SINCE the war there has almost been a revolution in the use of electricity in industry. The individual motorising of all separate items of machinery has replaced the centralised electric motor, driving long lines of shafting. In fact the motor is now being considered as an individual item in its own right and not as a substitute for the old steam driven mill engine. This has meant that each electrical drive must be considered on its own. The needs of the machine must be related to the potential power outputs of the available types of electric motors and where no suitable type of motor is yet in existence, a special design might have to be considered.

In this same period since the war, the use of electricity in gasworks both for power and lighting has spread rapidly. In the past the gas industry has been naturally prejudiced against its use becoming common in gasworks, but latterly with the rise in the cost of steam raising from solid fuel and the need for the greatest possible efficiency in gas manufacture, it has been accepted. Electricity is now recognised as the cheapest and most efficient form of power transmission and utilisation for large gas production plants. This is especially so if the power can be generated from waste heat steam by pass-out turbines. In the early days the prejudice against the use of electrical power may not have been wholly because electricity was the chief competitor of gas, but also because electrical drives were not completely satisfactory or reliable enough for the continuous service expected of such plant as exhausters, compressors or boosters.

Gas engineers could hardly be expected to be expert electrical engineers, so it was understandable that the type of electrical installation or design of drive was left in the hands of those who may not have quite appreciated the mechanical demands to be made on the electrical installation or how arduous the conditions were under which the electrical plant was expected to work. With nationalisation and the replacing of the smaller works by large centralised production units, it became possible to employ not only qualified electrical engineers throughout the industry generally, but also highly skilled electrical fitters. This ensured that the right type of electrical plant would be chosen for each specific installation and also that all motors, switchgear and even the cable connections were properly maintained.

The station engineer—essentially a gas and mechanical engineer—is, however, still in charge of the works, although it may contain a large amount of electrically driven machinery and electrical accessory plant, to the exclusion of steam driven prime movers. And so the more knowledge and experience he can gain of this branch of engineering, the more helpful will it be for him in conducting the affairs of his plant.

Mr. H. K. Nicholas's paper to the Manchester Juniors on 'Variable Speed Electric Drives Applied to Gas Pumping and Exhausting Machinery,' which we are publishing this week, sets out to do this and succeeds in clarifying a number of points of importance to the gas engineer. His paper deals first with the power requirements needed by certain gasworks' machinery, and since he is an electrical engineer, employed by a gas board, he is able to appreciate the conditions under which electrical plant will have to work in a gasworks. But first, he explains the type of power drive needed for exhausters and gas pumping machinery—variable speed and as far as possible constant torque at a given speed.

In the past electric power in gasworks was almost exclusively D.C., generated in many cases in the works by steam from solid fuel fired boilers. Latterly, however, with the decision to connect gas production

stations to the grid mains supply, both where power is generated locally or not, A.C. current has of course been adopted as standard. D.C. current had certain advantages, and it was generally more familiar to the gas engineer; it lent itself to easy motor speed variation by simply altering the motor's electrical field and the D.C. motor was for all intents and purposes a constant horsepower machine at all practical speeds. To obtain these advantages from A.C. current—speed variation is a necessity for exhausters and compressors—some form of rectifier might have to be included, and the paper shows how this can be done by means of the grid controlled mercury arc rectifier. This has indeed been successfully applied, but we think that the paper's description of the use of special commutators applied to A.C. induction and slipring motors is perhaps of greater interest, especially when it appears that motors of up to 9,000 h.p. may be modified in this way.

Other aspects of electrical plant dealt with include remote control and automatic speed regulation as well as a section on maximum demand and low power factor charges which form part of the North Western Electricity Board's tariffs. The need to keep the maximum demand as low as possible imposes a duty on the station engineer of carefully arranging the running of ancillary plant motors. These, together with plant which has to run continuously throughout the 24 hours, may cause a sudden rise in maximum demand, if started without due notice, and add a considerable sum to the yearly electrical power bill. Careful planning can avoid this. The fitting of capacitors at certain points of the installation will ease low power factor difficulties. They may be switched on or off as needed, and sections of the electrical installation working at low power factor may be corrected. Here again a 'drill' needs to be worked out and followed.

We feel that an occasional paper on the subject of electricity in gasworks is most necessary—in fact, we devoted a whole issue to it in August, 1957. Mr. Nicholas has dealt thoroughly and simply with certain points, which gas engineers will find both instructive and if applied, very much to their advantage.

The Sky No Limit

WHETHER we like it or not—and the sociologists definitely do not—city planners in this country are determined to build high. The 12-storey blocks of flats which are now a familiar sight in central London will soon be dwarfed by blocks up to 21 storeys, while blocks of 40 storeys or more are proposed. In England and Wales in 1947 multi-storey dwelling accounted for only 7% of the housing programme; in 1958 the proportion rose to 31% of the total. The trend seems obvious.

For the gas industry this type of development offers both an opportunity and a challenge. For once this is a problem for the technician to solve, rather than the salesman. Architects have their prejudices, some in favour of gas and some against, but in general they are only too pleased to adopt any method which provides the service required with the minimum modification to their designs. The latter are usually dictated by initial cost, but architects show a strong bias, understandable enough, against anything which mars their original conception. In the past the gas industry has sometimes been a little naïve in its attempts to persuade architects to adopt heating schemes which called for all sorts of unsightly flues. Today there is no longer any chance of getting away with that sort of thing. Terminals on outside wall faces are viewed with horror and the gas board which makes such suggestions is doomed from the start.

Fortunately development in the design of individual and shared flues has been rapid during the last few years, and the gas industry can now offer a heating service in multi-storey blocks of flats which in terms of convenience and cost is very attractive indeed. As yet, however, there is a certain absence of knowledge on the subject among sales staffs, including some of those who are specialists in new building. This is understandable enough since relatively few have had an opportunity of working on building schemes of this type.

For this reason the paper presented to the London Juniors on January 9 by Mr. H. J. Summerhayes is of particular value. The author is on the staff of the Headquarters Division of the North Thames Board and his paper, 'Gas in Tall Blocks of Flats,' is based on very considerable first-hand experience with building projects of the multi-storey variety. His exhaustive paper on communal and private laundry facilities, published in *Gas Service* in 1953, has been rightly regarded as something of a classic, and there is every reason to expect this latest work to achieve the same status.

There have been several excellent papers lately on Se-Duct and similar flues, but Mr. Summerhayes goes much further than this. He deals in great detail with the siting of services, risers and meters. Moreover, he has a good deal to say about the types of appliance best suited to multi-storey buildings. His pet subject of laundries is brought up to date in the light of present day thought on the matter, water heating and space heating are dealt with in a very workmanlike fashion with plenty of running costs to get one's teeth into, and in particular there is a most interesting section on incineration.

Little thought seems to have been given to domestic incinerators in this country, presumably because of the popularity of solid fuel boilers. However, present day building trends, and multi-storey building in particular, make household rubbish disposal a very real problem. Here is a perfect opportunity for gas to step in and collar a brand-new, remunerative market, and one more over which could be a stepping stone to a much wider utilisation of gas in tall blocks of flats. There is just one little snag—no appliances! But there is American experience to draw on and we hope it will not be long before British manufacturers have provided us with this much needed appliance. Perhaps Mr. Summerhayes' paper will help to stress the urgency of the matter.

We hope many readers will want to study this blueprint of a vital gas load. The paper will be published in the February issue of *Gas Service*.

Personal Notes

MISS EDITH BAILLIE has been appointed as the North Thames Gas Board's Chief Home Service Adviser. This follows the appointment of Mrs. Joan Robins to the post of Home Service Adviser to the Gas Council. Miss Baillie has been with the North Thames Gas Board for five years, and for the past three has been Home Service Organiser to their Northern Division. A Scot, she comes from near Dundee and received her training at the Glasgow Domestic Science School. Before going to the North Thames board, Miss Baillie worked at the Outward Bound Sea School, Aberdovey, and at the Infectious Diseases Hospital, Dundee.

Miss Edith Baillie

MISS K. BOSWELL has been appointed to the post of Senior Home Service Organiser to the North Thames Gas Board. Miss Boswell, after training at the National Training College, London, went to the North Thames Gas Board in 1932 and has been on the home service side of the industry for the whole of her service. She has now been Home Service Organiser to the Board's North Western Division for the past 11 years, and has helped considerably in the formation of the present-day set-up of the Board's Home Service Section.

MR. A. R. BENNETT has relinquished his post with Radiation Ltd., as General Manager, Research and Development. With the growth of the Group the need to intensify and specialise development work under the various production centres will mean that the part which will ultimately remain under central control will be confined strictly to general service functions. The Board accepts Mr. Bennett's view that this is not likely to provide sufficient scope for his undoubted technical abilities and by mutual agreement Mr. Bennett is leaving the Company to seek wider opportunities.

Obituary

MR. C. A. CUNNOLD of Sanderstead, Surrey, who was for 24 years station engineer at the Nine Elms Works of the Gas Light & Coke Company, retiring in 1937, recently died at the age of 86. He entered the service of the Gas Light & Coke Company in 1898 after having commenced his career in the industry at the Ramsgate gasworks. He qualified for associate membership of the Institute of Civil Engineers in 1898.

MR. JAMES ALLEN CUNNIFFE, formerly of the Swansea undertaking, Wales Gas Board, has died, aged 63 years. Mr. Cunniffe was the superintendent of the Moriston gasworks from its opening in 1924 to 1954, when he retired owing to ill health.

MR. P. K. MARLOW has been appointed Assistant Chief Accountant in a list of appointments announced by the North Thames Gas Board recently. Other appointments are:—L. A. W. SIMMONS to be Administrative Assistant to the Commercial Manager, C. P. HENSHILWOOD, Officer in Charge, Meter Laboratory, Watson House, L. J. MIRAMS, Mechanical Engineer, Southall, H. J. C. ROE, Office Manager, Northern Division, W. F. H. SMITH, Assistant Labour Relations Officer, J. W. G. TATAM, Service Manager, Western Division, A. L. WITT, Service Manager, Northern Division, H. J. R. TUCKER, Commercial Assistant to the Divisional Manager, East Essex Division.

MR. GORDON HELPS, Joint Managing Director of Humphreys & Glasgow, Ltd., has retired, some 12 months short of normal retirement age, on account of ill health. He is 63. Mr. Helps, a graduate of Leeds, joined Humphreys & Glasgow, Ltd., in 1919 as an assistant engineer. He later assumed responsibility for all design and drawing office work as well as procurement. He joined the Board of Humphreys & Glasgow in 1939, and became Joint Managing Director in 1954. He was also a Director of Gaz à l'Eau, the French associate company of Humphreys & Glasgow, Ltd., and was concerned with work carried out on the Continent over a number of years in association with Demag of Duisburg.

MR. H. WEST has been appointed Assistant Managing Director of Metropolitan-Vickers Electrical Co., Ltd. Mr. West ceases to act as Director of Electrical Engineering.

Diary

January 29.—EASTERN JUNIORS: Spalding. 'Modern Methods of Leakage Detection in Mains and Services,' by E. R. Fitch.

February 2.—SOCIETY OF ENGINEERS: Burlington House, London, W.1. Inaugural Meeting for 1959. 5.30 p.m.

February 3.—SOUTH EASTERN G.C.C.: Caxton Hall, Westminster.

February 4. — INSTITUTE OF FUEL, LONDON SECTION: Institution of Civil Engineers, Great George Street, S.W.1. 'A Radio-active Corrosion Probe,' by D. Anson. 5.30 p.m.

February 5. — MANCHESTER JUNIORS: Gas Development Centre, Whitworth Street West, Manchester. Open Forum. 6 p.m.

February 5. — INSTITUTE OF FUEL, MERSEYSIDE SUB-SECTION: 9, The Temple, Dale Street, Liverpool. 'Statutory Requirements of Steam and Pressure Vessels,' by W. A. Mills. 7 p.m.

February 6.—LONDON AND SOUTHERN JUNIORS: 'Safety and Economy in Distribution,' by G. A. Westbrook.

February 11. — INSTITUTE OF FUEL, LONDON SECTION: Institution of Civil Engineers, Great George Street, S.W.1. 'The Industrial Use of Small Coal,' by J. N. Williams. 5.30 p.m.

'SKIFFLE' AT GAS LECTURE

A LARGE number of boys and girls from schools in Dorset and Bournemouth enjoyed a treat recently, when, at Sylvan School, Parkstone, Dorset, they watched gas flame perform fascinating tricks at the Institution of Gas Engineers' (London and Southern Section) Christmas demonstration and lecture on 'Flame' given by Mr. W. F. Thorne, Chief Chemist of the Southern Gas Board.

The experiments, which were designed to show some important fundamental properties and behaviour of flames, were rounded off by Mr. Thorne's 'skiffle group' playing tunes on gas-heated glass 'organ' pipes.

Mr. J. C. Hogg, Production Engineer, Dorset and Bournemouth Region, Chairman of the London and Southern Section of the Institution of Gas Engineers, took the Chair for the morning lecture and Mr. A. F. Hetherington, Deputy Chairman of the Southern Gas Board, in the afternoon.

Regional exhibitions by Southern Gas Board

THE Southern Gas Board is staging exhibitions in each of its regions to give hoteliers and commercial caterers an opportunity to see 'what's new' in gas catering equipment.

The exhibitions will include a number of demonstrations, not only of cooking but also of other aspects of catering which are of general interest to hoteliers. Technical colleges and national trade organisations are to co-operate with the Board in staging these demonstrations. The full list of dates and locations is as follows:

Weymouth: January 27-30, Gloucester Hotel.

Southampton: February 2-7, Southern Gas Service Showrooms, 166 Above Bar.

Portsmouth: February 10-14, Southern Gas Service Demonstration Theatre, The Square.

Reading: February 17-21, Southern Gas Service Demonstration Theatre, Friar Street.

Oxford: February 24-28, Southern Gas Service Demonstration Theatre, Therm House, St. Aldate's.

In addition, Mr. Therm will be represented at the Bournemouth Hoteliers' Exhibition at Boscombe, February 10-13, and in the Bournemouth Culinaire Exhibition in the Town Hall, Bournemouth, February 23-27.

Left to right: Sir Dennis Proctor, Mr. F. Litler, Chief Technical and Planning Officer, N.W.G.B., and Mr. T. W. Simpson, Production Engineer, in the drawing office at Bradford Road.

MINISTRY CHIEF VISITS BOARD

SIR DENNIS PROCTOR, Permanent Secretary of the Ministry of Power, visited the North Western Gas Board on January 20 with his Secretary, Mr. J. F. Gwynn, and the Regional Director of the Ministry, Mr. A. Wilson.

Sir Dennis toured the Board's Bradford Road production station, second largest in the country, with a total capacity of 30 mill. cu.ft. of gas a day.

In particular he inspected the Drakes vertical retort house (48 continuous vertical retorts with a capacity of 4 mill. cu.ft. a day) and the carburetted water gas house, in which are two Humphreys & Glasgow water gas units (joint capacity 6 mill. ft. of gas a day).

Later he was shown over the Board's Technical and Planning Division at Bradford Road, visiting the drawing office, production control room, and the offices of the chief executives of the Division.

Plant Engineers get change of title

INCORPORATED PLANT Engineers has changed its name to the Institution of Plant Engineers.

Since the Institution is a company limited by guarantee, any change in title needs the sanction of the Board of Trade and where the desired name includes both the words 'Institution' and 'Engineers,' such sanction is by no means automatically given. Furthermore, the Board's requirements are particularly stringent when a body holds (as the Institution does) a licence to dispense with the word 'limited.'

Essentially, the Board needs to be satisfied that the grant of the title will not damage the status and standards of the engineering profession as a whole or those of the established professional Institutions.

That permission has been granted is, in the circumstances, a gratifying recognition of the work of the Institution.

N.W.G.B.—Lewis's partnership spreads out after sales figures beat target

THE sales partnership agreement between the North Western Gas Board and Lewis's Ltd. under which Lewis's sell all kinds of gas appliances in their mammoth Manchester store on terms identical with those offered by the Board is to be extended to embrace Lewis's equally large Liverpool store.

A permanent exhibition of gas appliances will be opened in the basement of Lewis's Liverpool store on January 29. In it will be displayed a wide range of gas cookers, refrigerators, water heaters, washing machines, gas fires, gas radiators, gas-heated drying cabinets and gas pokers.

Regular demonstrations of cookery, laundry, and other household tasks, for which gas appliances are used, will be given by trained domestic science demonstrators provided by the Board and Lewis's.

The partnership between nationalised industry and private enterprise has been a resounding success in Manchester, a Board spokesman has stated.

He disclosed that, since the opening of the permanent exhibit by Lewis's, sales of gas appliances in the Gas Board's own showrooms have shown a marked increase and the weekly sales of appliances by Lewis's have exceeded the high target figure set.

'It would seem,' he said, 'that the gas appliance display in this great store visited by nearly 1 mill. shoppers every week has given the public in and around Manchester a brand new interest in gas appliances of every sort.'

Oil struck in Lincs.

OIL has been discovered by the B.P. Exploration Company near Gainsborough, Lincolnshire. A test well drilled by B.P. struck oil at a depth of some 4,600 ft., and during tests the well has produced at a rate of 15 tons a day. The new discovery is about two and a half miles west of Corringham, where the Company found oil in July. B.P. Exploration Company is now prepared to delimit the Corringham field, also the field at Bothamsall, Nottinghamshire which it discovered earlier last year.

Close-down at Rye

The South Eastern Gas Board's works at Rye closed down on New Year's Eve when the machinery was turned off for the last time by a ten-year-old boy, Francis Rook, the great-grandson of the man who installed the machinery 130 years ago. Gas for Rye now comes from Hastings.

The Prime Minister, Mr. Macmillan, and Lady Dorothy Macmillan visited the works of Head Wrightson & Co., Ltd., on January 14. After touring the works in which were seen some major fabrications for the iron and steel industry and giant heat exchangers for the Bradwell nuclear power station in course of construction, he lunched with Lady Dorothy in the works' canteen. He also inspected the steel foundry and met the directors and senior management of the Company, spending some time with the workers' representatives on the employees' council. To commemorate the visit the Prime Minister was presented with a book describing the sea voyage of the heat exchangers from the Company's works to the Bradwell nuclear power station. This novel method of transportation was necessary because of the size of the heat exchangers, which made normal delivery by rail or road impossible.

Central Scottish gasworks may disappear

ALL gasworks in the central area of Scotland may be closed when the final development of the Lurgi plant at Westfield, Fife, is complete.

This was stated by the Chairman, Sir Robert Nimmo, at a meeting of the Scottish Gas Consultative Council Central District Committee held in Dundee. The number of works, he said, will be reduced to 21 by the end of March, and the immediate object of the first stage of reorganisation was to get down to seven.

Sir Robert said interest had been aroused over the expectation that the Dundee gasworks will stop making gas within three or four years.

The explanation was quite simple. The Board had an obligation to consumers to keep the price of gas as low as possible. Since nationalisation many factors had combined to increase working costs in the manufacture of gas, coke, etc. The biggest factor was that there had not been the expected increase in the demand for gas which might have offset these rising costs.

Restricted choice

'This restricted demand for gas has to a large extent been brought about by local authorities and private builders making housing schemes all-electric, and so preventing the Gas Board doing business with their former customers. The smaller the demand the higher the price.

'Since there is a very considerable expanded demand for gas in industry, the effect of the reduced demand arising from the all-electric housing schemes could have a serious effect on industry and employment.

'The closure of certain gasworks is a consequence of all these factors.

'Obviously if the Board is denied the opportunity to do business with many of its former consumers, it has no alternative but to concentrate its production. This is the only way it can hope to conserve the inflationary pressure and protect the existing consumers.'

To meet the situation, a reorganisation of the whole of the Board's area was started about two years ago.

After they had got down to seven works, it was hoped that the new Lurgi plant at Westfield would be producing gas, and in the second stage some of the seven remaining works would be closed.

'With the final development of the Lurgi plant, where it is hoped to produce much cheaper gas and of better quality, then the possibility is that all of the works in the Central Division may be closed unless there is a substantially increased demand for gas and coke.'

As yet there had been no redundancy problems. When the larger works were closed every effort would be made to treat the problem of redundancy sympathetically.

The fact that works were being closed did not mean that the Gas Board was going out of business. A complete grid system was being formed so that all consumers might be assured of adequate supplies of a standard quality.

The gas industry could make a substantial contribution to the solution of the smoke problem with both gas and coke. Even when works were closed, steps would be taken to ensure a continuation of coke supplies.

It was interesting to note that there had been a 300% increase in the sale of gas-fired boilers for domestic hot water and central heating in the past year in Dundee.

The gas industry had developed an alternative system of warm air central heating which was said to be a most effective answer to under-floor heating. The equipment for this had not yet been tried in Scotland, but one large local authority was making plans to do so.

Touring the Engineering and Appliance Division of United Gas Industries, Willey & Co., Ltd., and the Vulcan Stove Co., Ltd., recently, was Mr. R. F. Wood, Parliamentary Secretary to the Ministry of Labour, on the left of the picture. With him are Mr. W. H. Bazley, Works Director, the Vulcan Stove Co., Ltd., and Mr. P. P. MacDiarmid, Chairman, Engineering and Appliance Division, United Gas Industries. They are examining the new Devon Queen automatic gas cooker.

W.G.F. attack purchase tax

A SPIRITED attack on the purchase tax levied on household equipment was made by the Women's Gas Federation on the B.B.C. television women's programme on January 19.

Representing the 16,000 members of the Federation, was Mrs. Gwen Evershed their national Chairman, the wife of a South Woodford, Essex, solicitor. With her were two experts, Miss Eirlys Roberts, Research Director of Consumers' Association, Ltd., and Mr. Paul Bareau, an economist, to answer some of the questions put by members of the Bristol, Bath and Weston-super-Mare branches, who formed the audience.

On the subject of fires Mrs. Evershed said: 'We want clean air in our cities—so does the Government. So it is incomprehensible that there is a 30% tax on gas and electric fires and water heaters. It is unfair that so many articles that can make a housewife's life easier and happier are taxed. It is time the Government set up a Committee to investigate the problem.'

WHEN ALL IS SAID . . .

THE COAL UTILISATION Council, which announced towards the end of last year that it planned to spend £300,000 on publicity and promotional work in 1959 for coal and solid fuel appliances, has opened a big advertising campaign. National daily and Sunday newspapers are to be used extensively. Over 430 local newspapers are on the advertising schedule. A 30-second TV commercial is to be transmitted from seven stations every Sunday at peak times from February 15 to March 29.

Colonial Gas Holdings Ltd., and subsidiary companies show a net profit for the year ended June 30, 1958, of £199,007, compared with £178,998 in the previous year.

Gas industry beginning to look at P.V.C. pipe in much more favourable light

COMPANY CONCENTRATES ON DEVELOPING SUITABLE MATERIAL

IN recent years much has been written about unplasticised P.V.C. and the techniques for its use are well known. Plants built from rigid P.V.C., which was developed in Germany before the war, have been in operation for 20 years or more, showing it to be an important and reliable material.

The chemical resistance of P.V.C.—particularly when it is unplasticised—has led to its extensive use where corrosive attack may be expected. Rigid P.V.C. is light in weight, does not support combustion, has high thermal insulation and excellent electrical properties, and may be machined by conventional types of equipment. Piping made from rigid P.V.C. may be used continuously at temperatures up to 60°C. (140°-150°F.) though its mechanical properties are slightly lowered with increase in temperature.

High-impact grade

Despite the obvious advantages of ordinary rigid P.V.C. pipe, the response in this country has been much less than in Holland and Germany. British Geon, Ltd., a Company in the Distillers Plastics Group, has therefore concentrated on developing a material of unquestionable suitability, an aim ultimately achieved by the development of Geon RA.170, a high-impact grade of rigid P.V.C.

A number of companies are now using this material for the production of a standard range of high-impact P.V.C. pipes and fittings. These firms include: B.T.R. Industries, Ltd., Extrudex, Ltd., Thomas De La Rue & Co., Ltd., David Moseley & Sons, Ltd., and Yorkshire Imperial Metals, Ltd.

High - impact P.V.C. fittings—screwed and plain—include T-pieces, bends, elbows, reducers, unions and valves. Connections are also available for coupling P.V.C. pipe to metal installations. Jointing can be achieved in four ways; solvent welding, threading, heat sealing and shrink fitting. The solvent welding technique can be used for plain socketed fittings and flanges, whereas heat welding is achieved by means of a hot-air gun and welding rod. Shrink fitting is carried out by belling the pipe end after heating to about 120°C. and applying further heat when the unbelled section is inserted. This causes the belled end to shrink on to the other section, giving a water-tight and air-tight joint.

The successful use of Geon RA.170 in pipe form depends upon three factors: The material, the extrusion technique employed, and the engineering know-how for correct installation. Unlike some rigid plastics, cast iron and similar materials, Geon RA. 170 will not shatter; its impact strength is some 15 times higher than that of ordinary rigid P.V.C. It is this high-impact strength, coupled with its natural resilience and non-corrodibility that makes this new material so eminently suitable for the manufacture of pipe material for gas and water lines, as well as other services which are from time to time subject to excavation. High-impact P.V.C. pipe can be produced in any length, the limit being set only by the transport problems involved. The average limits for working pressure for pipes of different diameters are; 1 in., 200-300 p.s.i.; 3 in., 100-200 p.s.i.; 6 in., 100-150 p.s.i.; and 12 in., 50-100 p.s.i. Since high-impact P.V.C. is a thermoplastic material, pressure rating falls as the temperature is increased, and allowances of the following order should therefore be made; at 20°C. (68°F.), as specified, at 40°C. (104°F.), 75% of rating and at 60°C. (140°F.), 40% of rating.

Chemical resistance

For the pipe engineer there are a number of advantages. High-impact P.V.C. pipe has excellent chemical resistance which makes it important not only in the construction of chemical plant and pipe-lines, but also for civil engineering uses involving prolonged contact with acid soils; a further very important advantage is its low weight. Geon RA. 170, with a specific gravity of 1.36, is about a fifth of the weight of cast iron or steel with specific gravities of 7.03 and 7.83 respectively. It is so light, in fact, that two men can carry with ease a 40-ft. length of 6 in. bore tube capable of working safely at 100 p.s.i.

The comparison between metal pipe and pipe made with Geon RA. 170 may be made either on a 'per foot run' basis, or on an 'installed cost' basis; the latter provides a more realistic figure. Apart from the obvious economies in time and labour which are apparent from the simple but effective jointing procedures outlined above, the much lower weights involved enable quite

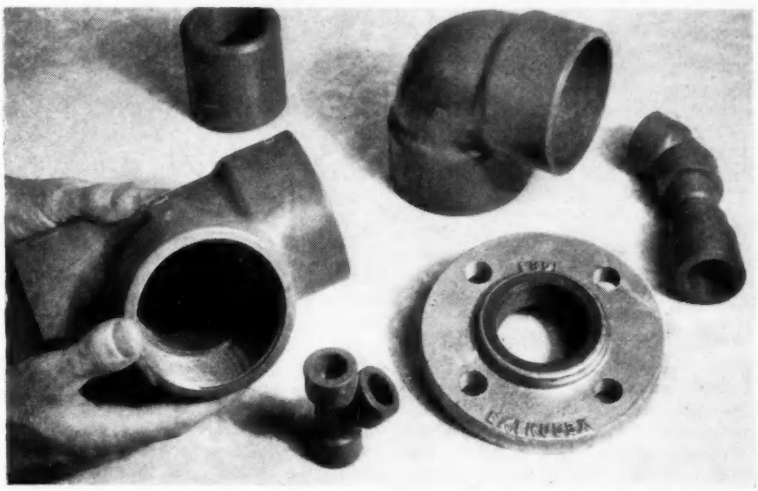
A length of Hipact high-impact P.V.C. pipe which has been carrying town gas at the Barry factory of British Geon Ltd., for the past twelve months.

large sections to be man-handled without the use of special lifting gear. For example, two men can solvent weld 5,000 ft. of 2 in. pipe into 20-ft. lengths in four hours.

Serious problems

It is well known that buried gas pipes corrode in acid soils and present very serious problems. It has been estimated[1] that, of the total area of Britain, 'about one-sixth . . . consists of formations where rapid deterioration of cast iron may take place and a further one-sixth may provide corrosive conditions to a lesser degree.' The corrosion of iron and steel pipes causes much concern to the gas industry, though very little has been published on this subject to date. In 1956 the Pipes Committee of the Institution of Gas Engineers began issuing forms to area boards for reporting failures of cast iron gas mains, to enable them to study causes in detail.[2] Though the gas industry has tried to combat this constant threat to its distribution mains and services, these attempts until fairly recently had been confined to trying to protect the metal from attack, and had never been fully successful.

Quoting again from the Pipes Committee report,[2] the position at the end of November, 1956, was that 'a number of plastics pipes have been examined and tested by members of the Pipes Committee and, in general, they have not been found satisfactory because of their inability completely to withstand attack from hydrocarbons. Nevertheless, certain plastics products appear to be reasonably resistant to attack, and it is felt, might perhaps be used with advantage for temporary gas main riders.' The report, as originally printed, adds: 'The Committee considers that plastics pipe should not be used as gas service pipes.' But in a later copy it was noted that this sentence had been deleted and a printed correction slip substituted with the following statement: 'The Committee considers that plastics materials may also be used for gas service pipes, but only as far as the point of entry into a building.'



A selection of fittings moulded in Geon RA.170. These fittings include T-pieces, elbow bends, couplings, adapters and flanges, and they considerably extend the scope for the use of Hipact pipe made of the same material.

Much tougher

The gas industry is, therefore, beginning to accept rigid P.V.C. as a suitable material for gas services. The advent of the much tougher Geon RA. 170 pipe should certainly aid the development of this market. All the major gas undertakings have been approached, either by British Geon, or by one or more manufacturers of high-impact P.V.C. pipe, and the response to date is most encouraging.

The main development work in this field is being undertaken by plastics pipe manufacturers, and the only significant technical difficulty reported to date is caused by certain individual components in town gas, made in a few particular areas. This is being studied, these odd components identified, and the matter is being further discussed. British Geon is working with the Gas Council, the North Thames Gas Board and the South Eastern Gas Board.

The Gas Council and North Thames Board have been examining both ordinary and high-impact rigid P.V.C. pipe. It is understood that so far P.V.C. has proved itself completely satisfactory for carrying coal gas, and it is anticipated that when the six months' test period is completed, high-impact P.V.C. pipe will be fully approved for this purpose. In addition it can be reported that an experimental 12 in. gas main has been in use in the South Wales area for 12 months, and so far there has been no sign whatever of deterioration.

This picture illustrates the lightness of P.V.C. pipe.

REFERENCES

[1] Interim Report of the Departmental Committee on the Determination of Cast Iron and Spun Iron Pipe. H.M.S.O. 1950.

[2] Report of the Chairmen's Technical Committee: 1955-56. I.G.E. Comm. 492.

NEW TECHNICAL EQUIPMENT IN U.S.

The first in a series of articles from our American Correspondent, designed to keep you in touch with technical developments in the United States.

THE all-gas kitchen has appeared as a new appliance concept that was designed for installation as a 10-ft. wall. It was presented, as a prototype, by the American Gas Association to Press and industry representatives.

The all-gas wall unit includes a cooker, refrigerator, water heater, laundry washer-dryer and a house heater. An air conditioning unit can be added.

With the high-pace of appliance competition on the American scene, Mr. Chester S. Stackpole, AGA managing director, characterised the 'Multimatic Wall' as a 'dramatic break-through in the home appliance field.'

Consolidation of the five kitchen appliances results in a most efficient use of space. Construction as a wall enables use of one interior partition and eliminates the necessity for devoting floor space to conventional free-standing appliances. Basement or utility room space is not necessary for laundering, house or water heating.

Most household tasks can be performed within a few feet. Food storage and cooking are provided for in the same unit. Top burners fold into the wall to give extra counter space. Piping and wiring are built into the Multimatic wall with single-point connections for water, gas and electric service.

Purchasing and handling are simplified since the wall is designed for complete assembly at a factory, to be shipped ready for installation. It is 10 ft. long; 7 ft. 11 in. high; 32¼ in. deep.

The purchase price for the complete unit is believed to become less than for the individual conventional units, purchased separately. The self-contained venting system eliminates the need and cost for chimney construction.

The prototype Multimatic wall has had exhaustive tests for safety, durability and performance. Access to all components is through the front panels. Each component can be removed separately.

This AGA project was started in 1955 as part of the Association's research programme. Mr. Walter Dorwin Teague and his design and engineering firm were retained to design and build this prototype.

More than 18 cu. ft. of storage cabinets is included in this dramatic view of the 'Multimatic Wall' gas kitchen which features foldaway cooking burners, wall oven-boiler, refrigerator, water-heater, washer-dryer, and warm air furnace.

Relay system

A NEW transistorised amplifier relay system for remote control of temperatures in industrial processes has been introduced by a major instrument manufacturer.

The system consists of the amplifier which serves as the temperature controller and a vibration-proof mounting containing the thermistor which acts as the sensing element. The two units can be as much as two miles apart.

Mountings for the thermistors can be as small as $\frac{3}{32}$ in. diam. by 2 in. long. These mountings will withstand blows from a hammer without damage to the sensing element, the manufacturer states.

Applications of the system are said to be 'virtually unlimited.' It may be used to control air, surface or immersion temperatures.

Amplifier relays are available in eight overlapping ranges of approximately 100°F. to permit control from 60° to 520°F. Control point is described as 'very stable,' with shift of less than 1°F. for every 70°F. change in ambient temperature. One amplifier relay can be used with a variety of heat sensing units.

The amplifier can be mounted either on a surface or flush. Wiring between sensing element and relay does not need to be shielded since the D.C. bridge circuit does not present a capacity balance problem. The relay has a load rating of 1,500 watts at 240 V.

Test probe

A PERMANENT test hole assembly for gas leakage detection in areas where frequent drilling is costly and hazardous has been developed by Heath Survey Consultants, Ltd. of Canada.

The assembly was designed to accommodate a gas probe, which is forced through a resealing neoprene diaphragm to obtain a sample of the subsurface atmosphere. The tests over a route can be conducted by an operator who remains seated in a vehicle; no tools are needed and there is no necessity for removing caps or plugs at the test locations.

The body of the unit is made of cast iron and brass to provide a long service life. It includes a filter material that removes dust from the atmosphere samples removed by the probe.

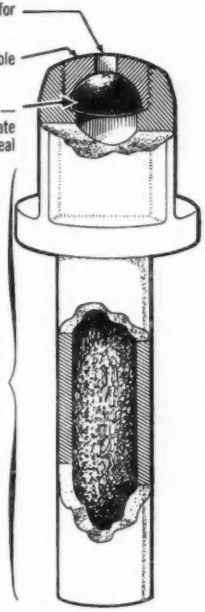
Mr. Charles A. Heath, Vice President of the firm, invented the device. Its principal application is in paved areas where repeated test-hole drilling is undesirable and, it is said, consequently presents an economy in maintaining reliable surveillance of those areas.

The unit is installed flush with the surface of the pavement. External fins maintain its position after installation.

After drilling the usual bar hole, it is

augered deeper to the approximate depth of the gas main. That deeper hole is filled with crushed stone, except for the top six inches. The new unit is placed in the hole, any necessary repaving is done and the permanent test location has been completed.

This method of making leakage surveys has been estimated by the Heath firm to reduce the time required for the


PROBE INSERT HOLE — for instantaneous testing.
BRASS PLUG — removable for purging operations.
NEOPRENE DIAPHRAGM — depresses to accommodate probe, snaps back to re-seal unit.
Cast iron body and expansion pipe, filled with porous filter material to remove dust from sample to be tested.

The test hole assembly for gas leakage detection.

surveys to 25% of the time required for earlier methods. In some instances, the time reduction has been greater.

When streets are resurfaced to a higher level as a result of added paving materials, a simple extension has been developed for raising the surface test cap to that new level.

The unit has been designated the 'Auto-Test-Insert.'

Space saving

A BI-METAL dial thermometer, available in two temperature ranges, has been introduced as a space-saving instrument that requires only 3 in. of panel space. The dial construction eliminates parallax error with graduations set on a raised ring that is close to the cover glass and at the same level as the pointer. Figures and graduations are in black on the white dial. The low-mass coil of the thermometer responds quickly to temperature change, the manufacturer states. The coil is centred and welded in the stem to eliminate retard effects which might be caused by rubbing against a side wall. Surrounding silicone fluid speeds heat transfer and dampens vibration.

The stainless steel case, ring and stem are resistant to the effects of most operating conditions. The stem is said to give a tight closure against process pressures.

This instrument is rated for installation indoors or out, regardless of climate or atmosphere. The standard indicating ranges are 80° to 120°F. and 200° to 1,000°F.

More flow meters

AN enlarged line of indicating flow meters for air/gas has been introduced with scale ranges from 30 cfh to 60,000 cfh. For ranges to 3,000 cfh, these meters are installed directly in the flow lines. Shunt arrangements are used for higher ranges. The instruments have gear-driven pointers with 4½-in. or 6-in. round dials with scales covering 180° or 240°.

All instruments are hermetically sealed and may be installed in either vertical or horizontal positions. The manufacturer states they are unaffected by vibrating conditions.

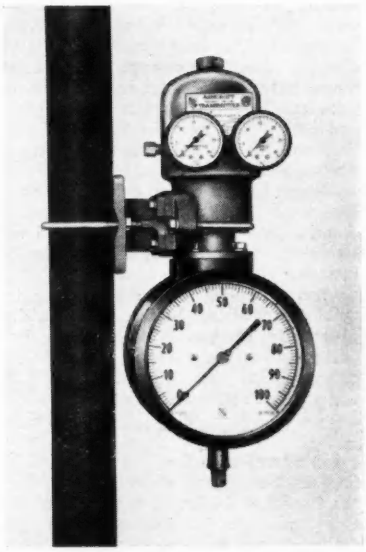
In operation, a portion of the flow acts upon a vane that rotates and operates the gear-driven pointer. The area of vane engagement with the flow stream serves to average velocity differences and turbulence to provide an approximation of ideal laminar flow, the manufacturer states. A very small constant pressure drop across the meter provides sufficient power for operation.

Accuracy

PNEUMATIC transmitters for pressure and temperature have been added to the line of equipment produced by a manufacturer and are available in indicating and non-indicating models.

One transmitter measures and indicates pressures to 100,000 p.s.i. with an accuracy that has been placed at + or − 0.5% by the manufacturer. The output to the receiver is in the range of 3 to 5 or 3 to 27 p.s.i., with the signal proportional to the input pressures. The transmitter operates on a motion-balance principle.

Another transmitter, non-indicating, feeds to gauges, recording receivers or controllers. It has standard ranges to



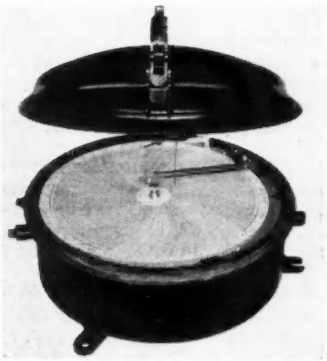
Series 1250 solid front Ashcroft pneumatic pressure transmitter.

100 in. and to 20,000 p.s.i. Here too, the accuracy is placed at 0.5% and the sensitivity at 0.1%. Basically, the equipment is a 6-in. cube with no linkage gears and a minimum of parts and bearings. The manufacturer states it has 'no measurable dead-zone.'

The temperature transmitter is applicable in installations where a thermostatic element is more desirable than a thermocouple. Low-pressure air is transmitted in direct proportion to the temperature being measured.

Watertight recorder

THREE new pressure recorders were designed for gas metering and regulating stations with particular attention to those that have potentially dangerous water conditions. Each of the new models is available with resistance-



Sealed with a sponge ring, the manufacturer of this pressure recorder claims it can be operated in water to a depth of 5 ft.

welded 3-in. diaphragm element for measurement of gas pressures to 10 in. Copper nickel alloy and the welded construction are said by the manufacturer to prevent element failure and give an accuracy of + or −0.5%. Light-weight drawn aluminium cases, 5½-in. deep and 13 in. in diam., house the 12 in. circular recorders. Pressure ranges higher than 10 in. are measured with bellows, spiral or helical elements.

One of the new recorders, with either one or two pens, has a drawn steel door that seals watertight against a sponge rubber 'O-ring,' and can be operated when submerged in water to a depth of five feet, the manufacturer claims.

Burner features

A NEW gas burner with a large radiant heat surface and high rate of heat transfer without flame impingement has been developed for industrial heat processing applications.

The burner features, according to the manufacturer, include high-speed combustion and rapid penetration of the work by radiant energy thereby reducing furnace size with resulting economies in furnace cost and operation.

Any fuel gas can be utilised by this burner. Air-gas mixing takes place in the stainless steel nozzle outlet. With short flame length and low velocity of

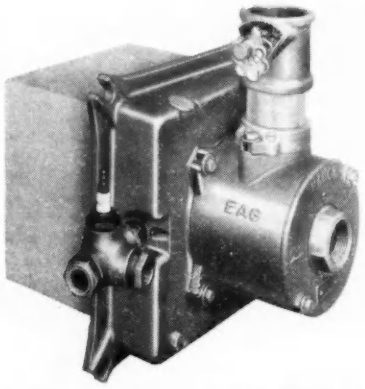
combustion gases, heat can be distributed uniformly throughout the combustion chamber. Turndown ratio is described as being more than 10 to 1, depending upon the air pressure.

Burner design features concentric air and gas nozzles with large-area discharge ports. Metal parts do not extend into the refractory radiant cone, and they are protected by cool air and gas flowing over them to avoid oxidising. The refractory burner block is made of a high-temperature castable material.

The burner may be controlled manually or by automatic pressure-proportioning controls.

Stable flame burner

AN excess-air gas burner for sealed-in firing of industrial furnaces, kilns and other heat processing equipment has been developed and produces, the manufacturer states, a stable flame with 1,000% excess air. Greater forward velocities of hot combustion gases produce improved distribution, circulation and penetration of heat. Flame temperature is said to be controllable with either large or small volumes of excess air. Also, stratification of hot gases is minimised and thereby eliminates localised 'hot spots.' The claim is made that because of the combustion characteristics, fewer burners are needed in given installations. Ignition is described as positive at any burner setting in hot or cold equipment, without the requirement for a continuous pilot. The manufacturer states that 'there is no burner flashback.'



The excess-air burner for sealed-in firing of industrial furnaces.

Flame protection can be applied since the burner design permits the use of pilot protection, main flame supervision or both.

Burner body and nozzle are of heat-resisting alloy; the tile is high-temperature refractory. The assembly can be installed with the air inlet at any of four 90° quadrants.

Gas and the five-card trick

GAS appliances will again play an important part in this year's Daily Mail Ideal Home Exhibition, at Olympia, from March 3 to March 30.

The Gas Council again takes two stands. At the main one in the Grand Hall the theme is Mr. Therm's 'Five Card Trick.' It features, in attractive settings, the five principal domestic uses of gas—space heating, cooking, water heating, home laundry and refrigerating. The second display shows the home laundry side, with gas or gas/electric washing machines and gas-heated drying cabinet.

Gas cookers for every size of kitchen will be shown by Sidnel Flavel & Co. Ltd. Their Courier three-burner cooker will be shown for the first time. It fits flush to the wall and is only 19 in. wide. New features include the hinged top to the inside of the oven dropping down for easy cleaning. Other exhibits will be the Envoy III, the Autocrat and the Spacemaster, which splits into two units.

Parkinson Cowan Appliances Ltd. (Gas Division) show their new Prince cooker at the exhibition for the first time. It combines the modern short splashplate with a convenient high level grill and large plate rack. Also on show will be the Renown Six.

Established favourites side by side with new 1959 models will be exhibited by R. & A. Main Ltd., including the new Main Apollo thermostatically-controlled instantaneous sink water heater; the Centurion cooker, with self-lighting burners and high-level grill, and the Talisman cooker. Two new refrigerators will also be on show, plus fires and their latest gas washer with foldaway wringer, the Morley 59.

Their full range of water heaters will be put on display by Ascot Gas Water Heaters Ltd., among them the famous Ascot 715 balanced flue multipoint water heater. The display also includes Ewart water heaters and FA heat appliances.

General Gas Appliances Ltd. will be showing their Auto-range gas cooker, which is fully automatic for pre-time set cooking. It comes in white, cream, green and blue. Also on view will be Conray fires and heaters and Senior and Junior Star cookers.

Stoves Ltd. will be exhibiting their Newhome models, all of which have a Super vitreous enamel finish. Their Landmark convector gas fire will also be included.

Working models of a Potterton Diplomat 44 gas-fired boiler will be displayed by Thomas Potterton Ltd.; and Cannon (GA) Ltd. will be showing their cookers with the exclusive visual grill which folds away when not in use.

Four hundred retired employees of the Scottish Gas Board were entertained by the Board in the banqueting hall of the City Chambers, Glasgow, recently. The gathering was the first of its kind. Mr. E. G. Smith, Deputy General Manager of the Glasgow and West of Scotland Division, acted as chairman.

Institution name 1958 examination pass winners

THE INSTITUTION OF GAS ENGINEERS announce that the following candidates passed the main subject examination under the old Regulations (Communication 275) and have now qualified for the award of certificates by completing ancillary subjects:

HIGHER GRADE EXAMINATIONS
Internal Candidate
Gas Engineering (Supply)

	Class	College
Bell, E. J.	Second	Westminster

ORDINARY GRADE EXAMINATIONS
Internal Candidate
Gas Engineering (Supply)

	Class	College
Butterfield, G.	Second	Leeds

DIPLOMA EXAMINATION
Gas Engineering (Supply)

Willes, H. G.	London

ASSOCIATE MEMBERSHIP EXAMINATION
Gas Engineering (Manufacture)

Appleyard, P. N.	Harrogate
Armstrong, F.	Bristol
Armstrong, J. D.	Paisley
Buckland, R. G.	Purley
Bushell, A.	Elland
Chapman, D.	Bath
Chapman, D. J.	Northampton
Davies, C. C.	Leeds
Dean, K. F.	Bradford
Didlick, G. S.	Ludlow
Fenton, J. A.	Worcester
Forster, R.	Hull
Goode, J. S.	Birmingham
Gould, B.	Bristol
Gray, J. B.	Greenock
Green, P. O.	Birmingham
Gunn, E. J.	Stoke-on-Trent
Knight, P. D.	Cambridge
Lawrence, M. E.	Burton-on-Trent
Lewis, C. F.	Tipton
McGlashan, J.	Perth
Martin, J. N.	Biggar
Pagden, B.	London
Roberts, S. S.	Stirling
Robinson, B. F.	Lincoln
Sargent, J. J.	Port Talbot
Scott, K.	Pudsey
Spaull, J. B.	Shipley
Springthorpe, R. A.	Great Doddington
Thomas, P. S.	Derby
Thompson, G. A.	Stretford
Tweedale, A. W.	Elland
Waite, G.	Morley
Wolstencroft, K.	Newbury
Yiend, N. J.	Cheltenham

Gas Engineering (Supply)

Burgess, J. D.	Lincoln
Fountain, J.	Luton
Gloag, B. R.	Edinburgh
Hardwick, R.	Leeds
Hunter, W. J.	Liverpool
Keys, T. R.	Leeds
Kyffin-Hughes, J. M.	West Bridgford
Meikle, J. T.	Rutherglen
Rowe, A. W.	London
Russell, F. P.	Hounslow

The Institution also announce the award of Certificates in Gas Salesmanship and Consumer Service to the following, who come from the area gas boards indicated:—

First Class: Colley, V. W. (S.E.), Davis, R. E. (N.T.), Garbett, S. (Wales), McDonagh, J. (Scottish), Simmonds, P. (S.E.), Walton, J. E. (N.W.), Webster, H. (Scottish).

Second Class: Adams, S. J. (S.E.), Barrin... J., Batty, G. (N.), Bishop, R. W. (S.E.), Blakeborough, O. R. (N.E.), Bramley, C., Brig... G. W., Brown, D. R. (S.E.), Byrne, R. J. (N... Campbell, G. (Scottish), Carpenter, P. J. (S... Churchman, A. R. (N.T.), Coward, K. O. (S... Cowling, P. G. (S.E.), Crabbs, D. S. (S.), Dav... J. P., Ewards, R. D. (E.), Fleckney, F. (N.T.... Foottit, D. E. (N.E.), Franks, B. W. (Wale... Goring, K. A. (N.T.), Granger, H. (N.E.... Gurnsey, F. W. (S.), Hallpike, W. C. (S.E.... Holgate, T. E. (N.), McCarthy, D. P. (S.E.... Marchant, T. C. (W.M.), Middleton, A. E. (N.T.), Molloy, P. E. (W.M.), Munroe, W. ... (Wales), O'Reilly, D. F. (E.), Parker, E. ... Payne, D. J. (N.T.), Phelan, J. T. (S.E.... Pomfrett, K. P. (E.), Raistrick, K. (N.W.... Render, L. (N.E.), Richards, P. R. (S.E.... Robinson, P. F. (N.W.), Skinner, P. E., Smi... S. J. (S.), Taylor, L. S. (N.W.), Upfold, H. N. ... (S.E.), Warburton, J., Wilkinson, W. G. (N.W.... Willey, O. (N.), Wilson, A. (Scottish), Winmer... T. C. (Wales), Winterman, W. M. (N.T.), Woo... S. F. (S.E.).

From a paper to the Manchester District Junior Association of Gas Engineers, November 12, 1958.

Variable Speed Electric Drives Applied to Gasworks Pumping and Exhausting Machinery

By H. K. NICHOLAS, A.M.I.E.E.

ELECTRICAL ENGINEER, MANCHESTER GROUP,
NORTH WESTERN GAS BOARD.

FOR many years the gas industry used steam engines or turbines to drive its exhausters, compressors and boosters and their reliability was of a very high order. It was comparatively easy to connect a governor bowl to the controlling valve in the steam supply and thus to control the engine speed and gas output to very close limits. The use of 'cut-off' gear on steam engines and nozzle controlled gear on steam turbines played its part in the economics of this type of drive. In many cases the machines exhausted to back pressure and the exhaust steam was used in the various gas works processes. The machines were so constructed that adequate warning was received of wearing parts, enabling duplicate machines to be brought into service before complete breakdown occurred. The steam mains themselves were of large section and seldom failed. The installation was thus very reliable and the gas engineer was reluctant to replace steam drive with electric drive. Where this was done, the electrical system commonly installed was such that breakdown was inevitable sooner or later and in many cases an unsuitable choice of motor or starting gear led to some distrust of the reliability of electric drive. More recently the gas industry has employed electrical engineers and their better understanding of the problems involved has led to a recognition of the electric drive as having its own particular applications. The years since the war have seen the introduction of many variable speed A.C. motors the principles of which are obscure to the average gas engineer. This paper should assist him in his understanding of the various problems involved.

Constant torque

The driven machine. Reciprocating compressors, Connersville and Beale exhausters fall roughly into the category of machines requiring a drive at constant torque, and may be required to increase the gas flow, when the gas is being removed or supplied at the increased rate at the remote end of the gas main. In such a case the pressure or vacuum would remain constant despite the necessary increase of speed in the positive displacement machine while the torque required would remain substantially the same. The horse power needed to drive the machine would then be proportional to the output. Alternatively, the machine may be required to increase the gas flow and the output pressure or inlet suction simultaneously, in which case the torque must be increased and the horse power required would be proportional to some constant greater than unity. In practice a combination of pressure and output variation is almost invariably required. The speed of this type of machine varies from 90 r.p.m. for the Beale exhauster to 300-600 r.p.m. for the reciprocating compressor and to 800 r.p.m. for the Connersville exhauster. It is usual to employ a speed reducing gear box between the motor and the machine so that the dimensions of the motor may be as small as possible and so the machine may be cheapened. Here the electric motor is at a disadvantage when compared with the steam engine, but not with the steam turbine. Reference to Fig. 1 will give some indication of the torque speed and horse power speed requirements of this particular type of machines.

A turbo-booster is a non-positive machine, that is, if the speed is kept constant, it will pass a whole range of volume flows. The plot of these volume flows against the corresponding range of pressure rise is known as the volume flow-pressure rise characteristic of the turbo-booster. In general, as the volume flow increases from zero, the pressure rise increases to a maximum value and then falls off. The volume flow at which the peak pressure occurs is known as the surge point and at flows less than the surge point, unstable running or 'surging' may occur. The actual shape of the pressure rise-volume flow characteristic is determined by the

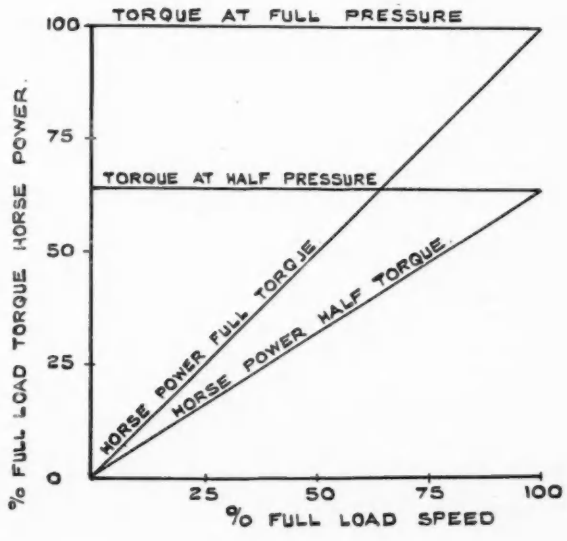


Fig. 1.

geometry of the turbo-booster impeller. The power absorbed by the turbo-booster at a given speed also varies with volume flow, and there is a tendency for the power to rise as the flow increases. However, by altering the geometry of the impeller, the shape of the power characteristic may also be altered and may be made to rise to a certain value of flow and then to fall off as the flow is increased further.

The pressure and torque of a turbo-booster are roughly proportional to the square of the speed whereas the power input is proportional to the cube of the speed. This means that the machine has a steeply falling torque characteristic from full load to no load. Both pressure and volume are often required to be altered, in some cases simultaneously, while at other times the machine may be required to run at high speed, backing up the main pressure while delivering a very small proportion of its rated output. The complicated characteristics and duties of the turbo-booster invariably mean that the driving unit must be designed to meet all these contingencies. Most turbo-boosters are high speed units and in many cases a speed increasing gear is required. Here the electric motor is at a disadvantage compared to the steam turbine but not when compared to the steam engine. Fig. 2 gives some indication of the turbo-booster characteristics and requirements considered from an electrical point of view.

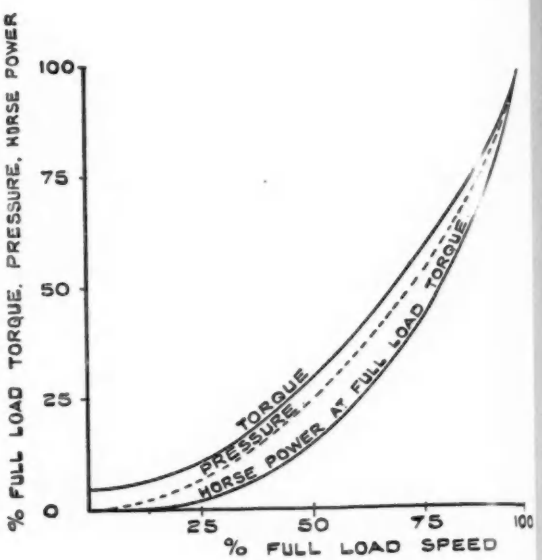


Fig. 2.

Types of electric drive. The D.C. shunt motor is too well known to warrant any detailed description and has been used successfully in the gas industry for many years. The variation in speed of this type of motor is accomplished by weakening the field and the important facts to be remembered are: (1) r.p.m. proportional to the back E.M.F. divided by field strength, (2) the torque proportional to armature current multiplied by field strength, and (3) the horse power proportional to torque multiplied by r.p.m.

Constant Horse power machine

Field weakening by means of a field regulator will obviously cause an increase in speed while from (2) it will reduce the torque available from the motor. This means that if the motor were producing its full rated horse power at the lower speed, then the speed increase must be accompanied by a reduction in load torque or the motor will be overloaded. With field weakening, the available horse power remains reasonably constant so that the shunt motor is commonly referred to as a constant horse power machine. It will be evident, therefore, that if full load torque is required at top speed as well as at bottom speed, the actual horse power available at bottom speed will be much in excess of requirements in order that the full motor horse power may be available at top speed. This is always the case with gas pumping machinery.

Fig. 3 shows the main characteristics of the D.C. shunt motor which may be used for reasonable outputs when a D.C. supply is already available. If the machine were to be large or of wide speed range, the above reasoning should be considered. In any case it would be undesirable to load up the existing low voltage D.C. system with this type of drive and other methods would have to be sought.

Mercury arc rectifier with D.C. motor. In this case the high or low voltage alternating current supply would be rectified to a suitable D.C. voltage by means of a combined transformer mercury arc rectifier, the motor and its characteristics being exactly as outlined above. The disadvantage is that the motor would require its own starting gear and the capital expenditure on the entire equipment would be rather high. However, this type of installation has been carried out with medium powers and speed ranges and has proved to be very reliable in service. The power factor of this type of equipment is very high indeed.

Grid controlled variable voltage mercury arc rectifier. This equipment would generally comprise a combined transformer rectifier set fed from a high or low voltage supply. The installation normally means that each rectifier feeds one motor only and the voltage supply to that motor armature is varied by means of grid control in

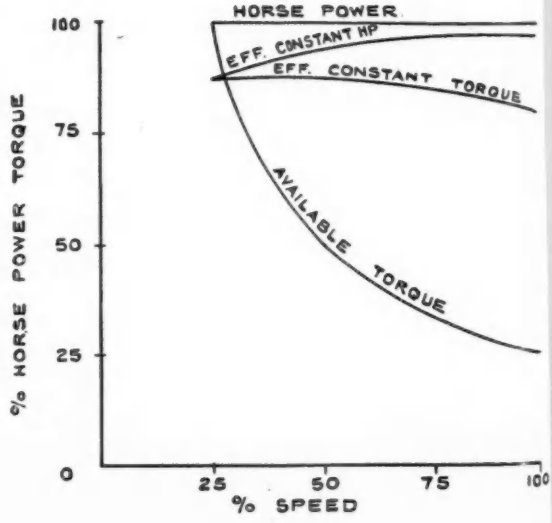


Fig. 3.

the rectifier. This type of installation requires no special starting gear for the motor, since the rectifier is switched on at minimum output volts and the voltage gradually increased until the desired speed is reached. The grid control unit and motor shunt field are normally fed from a separate rectifier which may take the form of auxiliary anodes in the main rectifier or may be a metal rectifier fed from an auxiliary transformer winding. This latter course is to be preferred particularly in cases where the motor may be overhauled by the load, in which case the main anodes would be extinguished and the disturbance might cause a partial interruption in the current flowing between the auxiliary anodes. This would mean loss of field current with disastrous results.

Phenomenon

The mercury arc rectifier is a device which transfers the half cycles of an A.C. sine wave in the same fashion as a commutator so that both half waves flow into the load in the same direction. The current can only flow from an anode if that anode is more positive than the associated cathode. A further phenomenon is that if a grid is placed between the anode and cathode and the grid made negative in relation to the cathode, then current will not flow.

The grid controlled rectifier makes use of this phenomenon by having a continuous negative bias potential on all the grids of the rectifier and applying in turn to each anode a positive triggering pulse which makes the anode fire. Once it has fired, the negative bias will not stop further firing but will prevent refiring at the beginning of the next half wave, in other words the length of time over which the anode fires may be varied in terms of each half-cycle. The R.M.S. value of the output volts in the second case will be approximately 50% of that in the first case. The firing pulse is normally phase shifted by means of a magnetic amplifier, the controlling agent being a small D.C. current which can be varied by the operator to give the required voltage output and thus the required motor speed. In many cases the motor field current is allowed to remain at a constant value, which means that speed is proportional to armature voltage. Full load torque may be obtained over the entire speed range and a speed load characteristic may be obtained which is reasonably flat. Shunt field regulation may be employed in addition, which gives a very wide speed range indeed but has the disadvantages of constant horse power applications as described above.

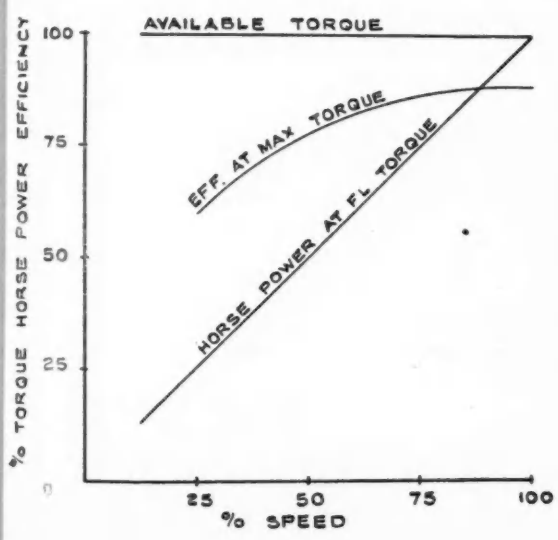


Fig. 4.

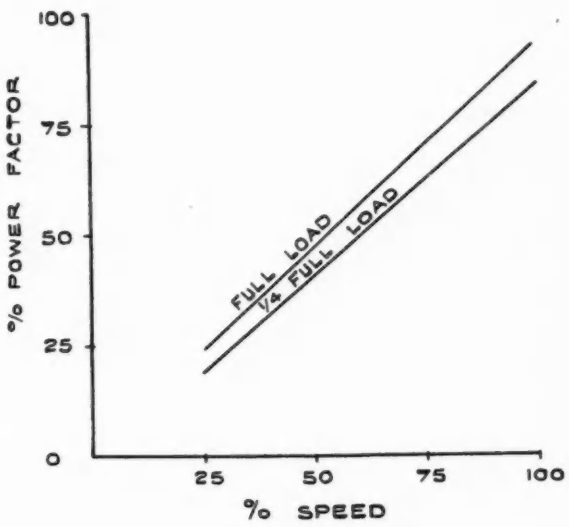


Fig. 5.

In certain small drives single anode rectifiers are available which may be connected in bridge form to existing low voltage mains, but this means that the motor must be wound for 500 volts if the system is 400-volt, 3-phase, 50-cycles. Mercury arc rectifier drives may be connected to any 3-phase supply of sufficient capacity and a speed range of 12:1 can be obtained as standard. The equipment can be supplied to give outputs up to 1,000 horse power with glass bulb rectifiers and higher with steel tank rectifiers.

Proportional to speed

It can be shown that the mid-point of the current wave lags considerably behind the mid-point of the voltage wave associated with that current, that is retardation of the firing instant causes a reduction in power factor. In this particular type of equipment power factor is proportional to speed and is not greatly affected by the load being supplied. If a part of the speed range were provided by means of a shunt regulator then the power factor would be constant over that part of the range, and would correspond to the power factor at the speed which would be obtained if no shunt regulator were in use. Fig. 4 and Fig. 5 illustrate the characteristics and power factor of this type of equipment.

Rotor fed A.C. commutator motor.—The rotor fed motor has a normal primary winding arranged on the rotor and the normal secondary winding is arranged on the stator. This arrangement would run as an induction motor turned inside out, the primary winding being fed through slip rings. An additional

normal armature winding with commutator is placed on the rotor, the frequency at the brushes being proportional to the difference between synchronous and actual speeds. Two sets of brush gear are placed on the commutator in such a way that they can be moved in opposite directions and each set is connected so that these armature currents may be fed into the stator winding. Now if the two sets of brush gear rested in line with each other the stator winding would be short circuited and the machine would run as a normal induction motor. If, however, the brush gear were moved so that a voltage was injected into the stator winding in opposition to the voltage already there, then this would act in a manner similar to a slip resistance and the machine speed would be reduced. If the brush gear were moved the other way, then the resistance may be considered as being negative and the machine speed would be increased. This type of machine is made with a speed range of 15:1 and in any size up to 600 h.p. The maximum voltage possible is 600. The machine has an inherent constant torque characteristic, but a constant horse power characteristic may be devised over a limited portion of the speed range. The power factor of the machine at full load varies proportionately as the speed is increased, but at low load is at a minimum at synchronous speed and at a maximum at top and bottom speed. Fig. 6 and Fig. 7 illustrate the general characteristics of this type of machine.

Slip energy

Stator fed A.C. commutator motor.—If a normal induction motor stator is fitted with a typical D.C. armature then the armature will rotate in the direction of the rotating field acting as a normal induction rotor. The slip energy will appear at the brushes after being converted to mains frequency by the commutator. The voltage will be proportional to the amount of slip. This slip energy could therefore be returned to the line by the use of a variable voltage transformer. The input to the motor stator is substantially constant

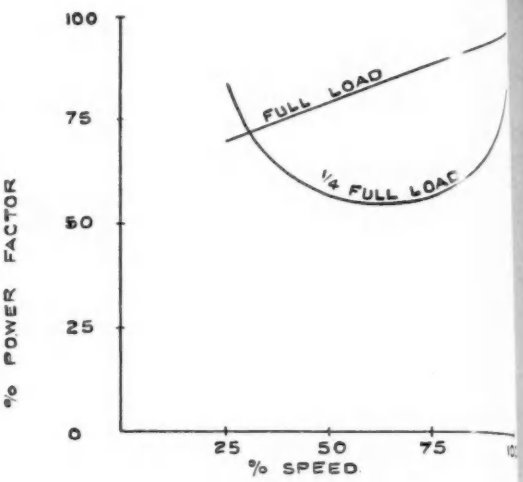


Fig. 7.

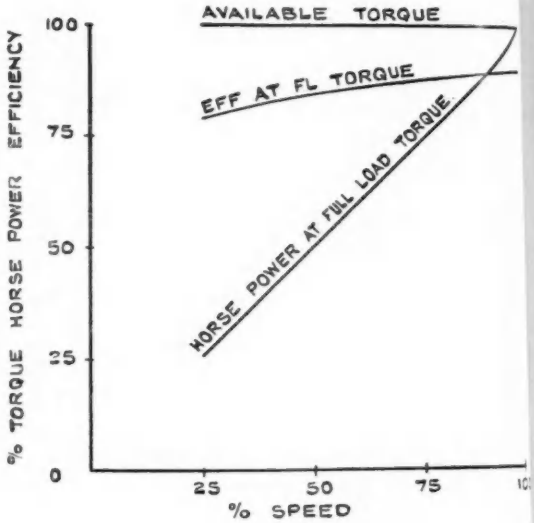


Fig. 8.

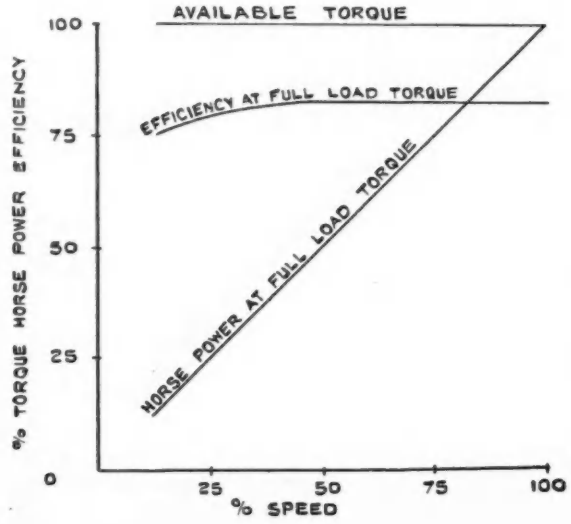


Fig. 6.

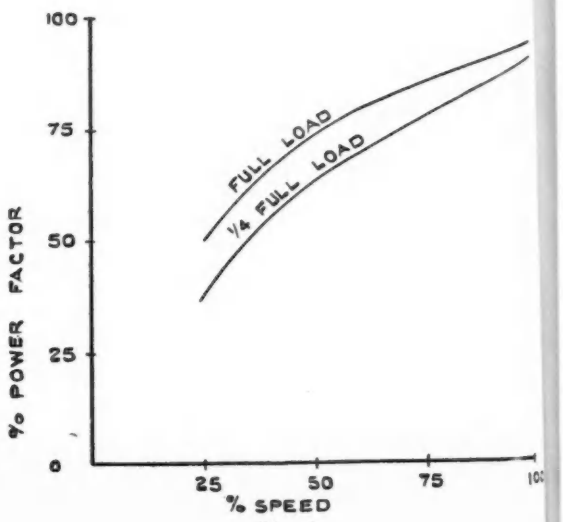


Fig. 9.

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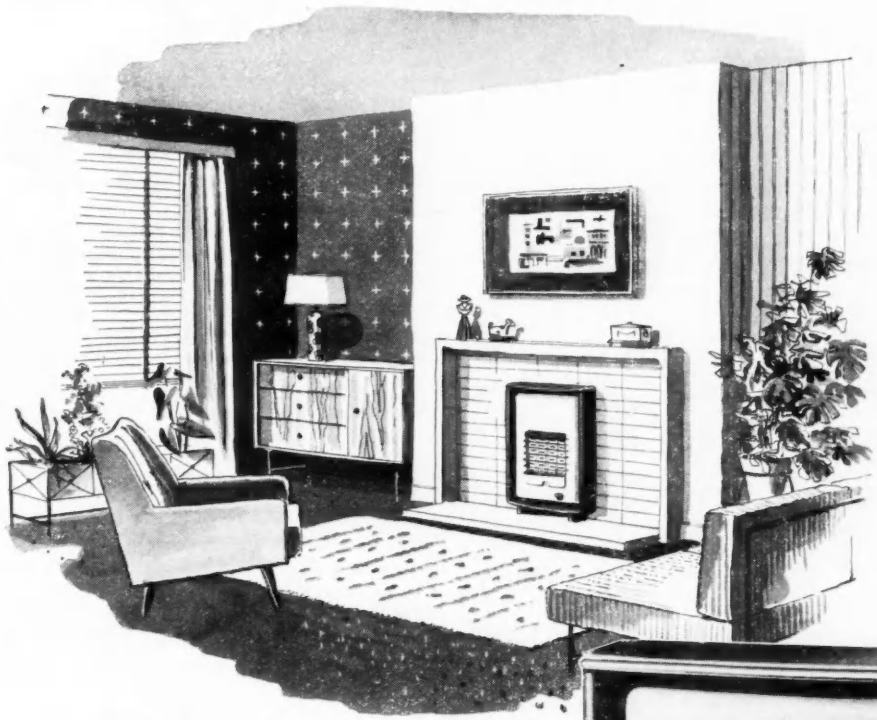

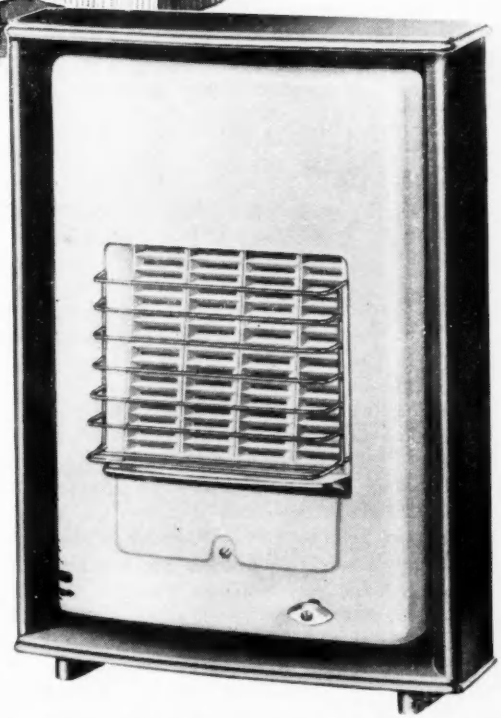

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and at synchronous speed the whole input is present as power at the shaft. At speeds below the synchronised, a part of this input is returned to the line through the induction regulator with consequently less power at the motor shaft. At speeds above the synchronised further energy is drawn from the line through the induction regulator and added to the power output already obtained from the stator. Speed is controlled simply by varying the relative positions of the primary and secondary induction regulator windings and in this way varying the voltage which appears across the brushes. The machine is substantially a constant torque machine with maximum torque available at any speed position. The power factor falls off as speed is reduced and is quite low at the bottom of the speed range. It is very important that the motor designer should be made aware of the circumstances if the machine is to run consistently at bottom speed so that allowances may be made for this in the design. The machine may be started by an ordinary direct-on starter or circuit breaker, and it can be supplied in a range of sizes up to 9,000 h.p. at a maximum speed of 600 to 700 r.p.m. Faster speeds may be supplied for smaller machines. It can be wound for any voltage normal to the equivalent size of induction motor. The movement of the induction regulator for speed variation purposes may be carried out by means of a handwheel, pilot motor, compressed air cylinder or any other desired means. The characteristics of this type of machine are shown in Fig. 8 and Fig. 9.

Governors. The speed variation of the various types of motor considered above is carried out in every case by means of a handwheel of reasonably small proportions. This means that the handwheel may be replaced by a small pilot motor with push-button operation. Alternatively, the push-buttons may be replaced by fully automatic operation, which can be accomplished as follows.

Potentiometer principle

A rheostat is arranged to be operated by a spring-loaded diaphragm connected to the outlet gas main such that the height of the diaphragm, and thus the position of the rheostat slider is proportional to gas pressure. The rheostat feeds one coil of a centre zero relay on the potentiometer principle, the arrangement being fed from a D.C. supply. The other coil of the centre zero relay is fed from a tachogenerator coupled to the motor shaft, its field being fed from the same D.C. supply. The centre zero relay is arranged to operate the retarding and accelerating relays of the equipment's pilot motor. Alternatively, the diaphragm could be connected across an orifice plate, in which case the system could be arranged to control gas flow. This system has been used in various patented forms with considerable success and in one case known to the author its installation has reduced machine hunting to a negligible value. When the grid controlled rectifier is employed, the potentiometer for speed control may be operated directly by means of a governor bowl and the electrical feed back to avoid hunting is contained in the rectifier control circuit itself. Many mechanical methods of governing are in use in which the electrical relays are replaced by mechanical relays eventually operating small microswitches for the control of the pilot motor. In power stations it is common to use combined pneumatic electrical systems often with a small cylinder carrying out the final operation of moving the speed control. Electrical methods however, have much to commend them in that the governing system may be matched exactly to the machine concerned and its characteristics altered to suit altered requirements as time goes on.

The author has tried to investigate the relative cost of the alternative systems described but has found that comparison of costs on a general basis is extremely difficult.

Considerably cheaper

At low horse powers both types of A.C. commutator machine appear to be considerably cheaper than the grid controlled rectifier. However, the speed range available with the grid controlled rectifier would be considerably wider than in the other two cases and it might well be that for particular applications it would turn out to be the most economical choice. At high horse powers the stator fed commutator motor and the grid controlled rectifier cost substantially the same and the rotor fed machine is slightly dearer. The comparison is affected when the machine is required for a particular speed range or output which may mean that the frame size for one or more of the alternatives will be unduly large. For very small horse powers the D.C. shunt motor is obviously the best choice if a D.C. supply is available. As far as possible, equipments should be wound for 400 volts supply up to 200 horse power and for 3.3 kV supply above that horse power. In many cases the high voltage supply is available at 6.6 kV and this would mean that motors above 200 horse power would need to be wound for that voltage.

When consideration is being given to the installation of gas pumping machinery it is first necessary to decide whether to install turbo-boosters or positive displacement machines. Centrifugal boosters, rotary boosters and reciprocating units each have their own field of application but generally it will be found that this will be decided by the relationship between the gas flow and working pressure envisaged for the installation. There is of course, a certain amount of overlap and in some cases any of the three main types may be suitable. When the decision as to which type of plant to install has been made, the salietn points of the motors should be considered.

All the types of motor described are very suitable for driving constant torque machines and in many cases may be wound for direct drive without an intermediate gear box. For turbo-boosters, where the characteristics are very complicated, no electric drive is absolutely suitable and great care is necessary to select a drive which is not uneconomical. The most important consideration when choosing the type of motor is the probable duty cycle of the machine concerned. The gas engineer should, as far as possible, be clear as to what duties he requires and in particular he must know if the machine will be required to run at light loads or low speeds for any length of time. Such information would mean that the electrical designer need not provide for every possible contingency and in many cases this could mean a reduction in first cost.

Assuming that each of the main types of motor would

be suitable for the particular drive in question, it is very desirable to obtain competitive tenders so as to provide the cheapest possible satisfactory solution for a driving unit. Another point to be borne in mind is the wiring cost and in particular with the proposed layout the length of main cables for each of the particular types. Final selection should be made on first cost, running cost, size of building required and suitability for the machine requirements. In some cases the characteristics at reduced load should be considered and in particular it should be noted that maximum efficiency and power factor may be required at low rather than at high loads. Power factor is of particular importance where the load on the station concerned is small compared with the size of the machine it is desired to install. Finally, when selecting a drive of this nature the type of maintenance personnel available to look after the machine should also be borne in mind.

Power factor

The text and diagrams will have shown that the power factor of most variable speed drives fed from A. C. sources tends to vary with the running speed. This is of little moment when the machine concerned is small compared to the total load of the works concerned. However, when the machine is fed separately or is large enough to influence the works power factor, unnecessary expenses may be incurred as a result of power factor penalty clauses in the tariff agreement.

The author is of the opinion that the most practical and economic method of improving the power factor of the gasworks load, including variable speed drives, is by the installation of static capacitors which may be switched on as desired. The capacitors should be connected at high or low voltage in the same proportion as the power factors of the loads at those voltages. They may be switched by hand, which means arranging a drill for each day, or automatically so that the power factor is always at the desired level. The supply tariffs in the Manchester area are such that the consumer pays a fixed price for the greatest half-hourly load incurred during the tariff period. This is known as the maximum demand. The consumer also pays a penalty of 1% of the maximum demand charge for every .01 the power factor is below .9, but any attempt to correct the power factor should not improve it beyond .9 unless the supply tariff is based on a kVA maximum demand.

Imagine a works load of 300 kW maximum with an overall power factor of .8 taken at high voltage.

The maximum demand charge on a monthly tariff would be:

	£	s.	d.
200 kW at 12s. 3d.	122	10	0
100 kW at 11s. 9d.	58	15	0
	181	5	0

The power factor charged is 10% of the maximum demand charge, *i.e.*, £18 per month, or £216 per annum.

The power factor could be corrected to .9 by the installation of a capacitor of 78 kVA rating, the cost of which would be about £250, including erection and connecting up. This means an annual return of 87% on the capital investment. Substantial saving can almost always be expected when a low power factor is improved.

Variable speed equipments often involve the installation of some apparatus which cannot be made flameproof except at considerable cost. Such apparatus will need to be weatherproof or provided with reasonable shelter in an atmosphere free from explosion hazards. The main motor may be installed in one or more of the following ways:

1. Flameproof. The motor is supplied and installed to meet the Factory Department's requirements for electrical apparatus to be used in explosive atmospheres.

2. Pressurised. The machine is totally enclosed and the air pressure within the enclosure is slightly raised above atmospheric to prevent explosive gases entering the motor. Arrangements must be made to scavenge the enclosure prior to each start.

3. Pressure ventilated. A pipe ventilated motor is used, clean air being brought to the motor through ducts. The ventilating fan must be arranged in the clean atmosphere such that all the ducting in the explosive atmosphere is under pressure. Again suitable safeguards must be made to ensure scavenging prior to each start.

4. Segregation. The motor and the driven machine are connected by a glanded shaft through a barrier wall which completely separates the motor compartment from the explosive atmosphere. Any type of enclosure may be used for the motor and the auxiliary apparatus is placed in the motor room. Segregation is the best treatment for variable speed motors. The general layout is simplified and cables are more easily fixed to give a neat arrangement. The saving in motor costs is often far more than the increased building expenditure.

LIGHTING IN HAZARDOUS SITUATIONS

THE Illuminating Engineering Society has just published a technical report entitled *Lighting in Corrosive, Flammable and Explosive Situations.* The report deals with hazards of explosion and fire which might start in lighting fittings, and with some conditions of corrosion which might affect their safe operation. The report is of particular interest to those manufacturing industries where atmospheric corrosion is a serious matter or where flammable liquids, vapours or dusts are present. The report does not deal with coal mines or explosives manufacturing plants.

The main sections of the report deal with (1) corrosion hazards, (2) fire and explosion hazards, and (3) maintenance. Four appendices deal respectively with (1) practical examples of protection, (2) chemical resistance of acrylic and unplasticised p.v.c. sheet, (3) flammable vapours and gases, and (4) bibliography.

This report will be most useful not only to engineers and contractors called upon to advise or install lighting equipment in such situations but also to those industries which have to contend with the risks dealt with in the report.

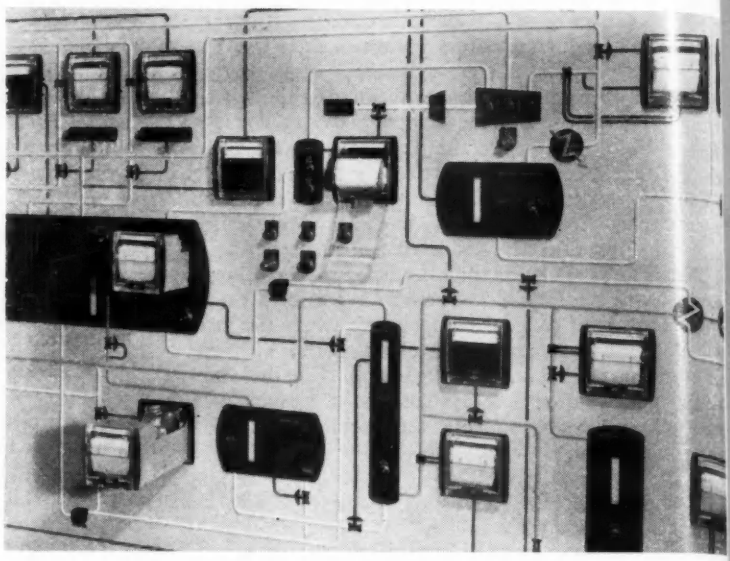
Copies of the report (price 5s., by post 5s. 6d.) can be obtained from the I.E.S., 32, Victoria Street, London, S.W.1.

Centralised control systems

FOXBORO - YOXALL'S Consotrol range of indicators, controllers and recorders has been developed to meet the needs of centralised control systems.

The illustration above is a close-up of part of a graphic panel recently completed at the Company's new Redhill factory.

The instruments shown here include M/54/58 pull-out recorder controllers, M/54 indicators, M/5001 ribbon indicators, M/57 switch and regulator sub panels and various signal lights and cancellation buttons used in the alarm system.



Part of a recent Foxboro-Yoxall graphic panel showing the use of the compact Consotrol range of instruments.

Air check valves

Two of the M/54/58 pull-out recorder controllers are shown partially withdrawn on the left. These instruments slide in and out of a sheet-steel housing which is secured to the panel and to which are attached the external connections. These electric and pneumatic connections are of the plug-in type and when the unit is withdrawn from the panel a series of air check valves automatically closes to prevent loss of pressure in the impulse lines.

This pull-out feature allows a complete instrument to be replaced with the minimum of interference with the process operation. It can be removed from the panel and replaced by a service spare unit on which the setting index and controller settings have been adjusted to agree with the values already obtained.

Exceptional clarity

Although the M/54 occupies a panel area of only 6 in. by 6 in. and can be mounted on centre lines as close as 7 in. it has a full 4-in. wide chart of exceptional clarity. The instrument in the centre of the photograph is shown with the chart mechanism pulled forward ready for chart changing, a matter of seconds only.

On the left of the open instrument an M/54 indicator is shown. This instrument is in all respects identical to the M/54 recorder except that the chart drive mechanism is replaced by an indicating scale. The parts are inter-changeable with the recorder and all functions, e.g., set point change and auto-manual transfer, are the same. This means that the operator is not faced with different operations on the same panel in order to perform the same functions from instrument to instrument.

Several examples of the M/5001 type of ribbon indicator may also be seen. These remarkably compact instruments provide a visual indication of process activity by means of a brightly coloured nylon ribbon which rises and falls behind a transparent glass scale in direct relation to increase or decrease of measurement. The instruments are available with single or double indicating scales and with high and low or high-low alarm contacts.

The two M/54/58 recorder controllers in the top left of the illustration are linked, as part of a cascade control system with M/57 SR switch and regulator sub-panels (seen immediately below the two instruments). These small panels provide for manual operation of the control valve and manual setting of the control index from the front of the panel. —*Foxboro-Yoxall, Ltd., Redhill, Surrey.*

Trade News

Enclosed degreasing

AFTER many years of producing a standard range of open-topped degreasing plants operated on trichloroethylene, I.C.I. are to introduce a standard range of totally enclosed mechanised plant for degreasing operations, the trichloroethylene degreasing plant Type E.

The work handling capacity of the new plant and the choice of treatments available is sufficiently flexible to enable it to deal with a wide variety of industrial metal degreasing problems.

The whole plant being enclosed, baskets are loaded and unloaded through a circular opening, closed by a sliding door. The cylindrical carriers for the work baskets are hung from a double chain conveyor. Although vapour should not escape above the condensing coils in the plant, added safety is ensured by the automatic suction ventilation which is applied as soon as the sliding door is opened.

A major benefit arising from the introduction of the new range of plant is that the intricate design work entailed in preparing a totally enclosed plant to special order will be eliminated, thus ensuring that customers receive quicker delivery.—*Imperial Chemical Industries, Ltd., Imperial Chemical House, Millbank, London, S.W.1.*

POWER-GAS GET SCRUBBERS ORDER

THE chemical plant division of the Power-Gas Corporation Ltd., has recently received an order for two Pease-Anthony scrubbers to treat gases from zinc sintering machines at the Swansea works of the National Smelting Company.

Pease-Anthony installations are successfully operating on blast furnaces, sintering plant, lime kilns, non-ferrous metal furnaces, spray dryers, superphosphate plants, etc.

Combined advantages

The makers claim that Pease-Anthony gas scrubbers combined the advantages of high efficiency, low cost, low water requirements and low maintenance, in removing micron and sub-micron dust and mist.—*Power-Gas Corporation, Ltd., Stockton-on-Tees.*

Compoflex Co. Ltd.

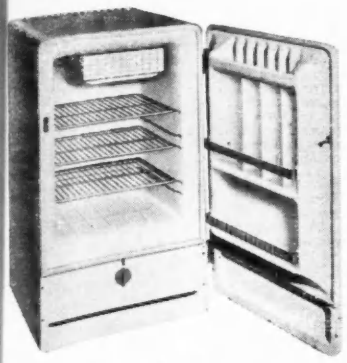
Compoflex Co., Ltd., have opened their southern warehouse and depôt at 109, High Street, Godalming, Surrey.

Main extend 'fridge range

R. & A. MAIN, LTD., have extended their range of domestic refrigerators by the introduction of the new 2.2 cu.ft. absorption type model which will be known as the Main No. 22.

A quality refrigerator at a very modest price, the No. 22 has an attractive modern appearance and a compactness that makes it ideal for locations where space is a vital consideration. Overall dimensions are 21 in. wide by 21 in. deep by 36 in. high. Being of the same height as the standard kitchen unit, and having a flat top, it can be easily and neatly incorporated into kitchen unit schemes.

With a shelf area of 5.4 sq.ft., it provides generous storage space. Conveniently positioned compartments in the door take four pints of milk, six eggs, plus fats and other small packages.



The new Main No. 22, showing the generous storage space in this compact refrigerator.

The ice-making compartment—designed to make ice in room temperatures of up to 95°F. (35°C.)—is equipped with two ice trays complete with flexible plastic dividers, each tray providing ten cubes. The compartment is fitted with a plastic lift-off door and, with the ice trays removed, it can be used to store about 2½ lb. of frozen foods.

Fluid expansion

Thermostatic control is effected by a knob, numbered from 1 to 6, situated on the front of the plinth base panel. The thermostat is of the fluid expansion type.

Five sets of shelf runners are incorporated in the one-piece liner, enabling the three full-width shelves to be positioned to accommodate packages of a wide variety of sizes. The shelves are covered in light blue plastic, making them smooth and very quiet in use.

Appearance

Available for delivery from March, 1959, the refrigerator is in either white or cream finish, both with attractive embossed red trims. The plastic lift-off door of the frozen food compartment is in light blue to match the colour of the door sealing strips, thermostat control knob, and the light blue anodised-aluminium retaining bars on the door compartments. The door catch is of the positive press-button type and is smartly finished in bright chromium plate.

Maximum gas input is 525 B.t.u. per hour. A constant pressure governor is fitted.

The cabinet and accessories are guaranteed for one year and the sealed cooling unit for five years.—*R. & A. Main, Ltd., 48, Grosvenor Gardens, London, S.W.1.*

Corrosion protection

A LIQUID plastic coating giving a surfacing material of inert synthetic resins with a hard flexible and lustrous surface, is claimed to be odourless, non-contaminating and non-inflammable when dry.

Nutracote does not oxidise, and its resistance to mineral acids, alkalis, oils and fats, combined with low vapour permeability and dielectric qualities render it a means of protection against a wide range of corrosive conditions. Nutracote is said to be particularly suitable for the protection of plant and structural steelwork, which may be subject to sulphuric acid corrosion.—*Tanks & Linings Ltd., Town Wharf, Droitwich.*

COMPUTER ON SHOW

WHAT is claimed to be 'the world's most versatile and flexible analogue computer,' the Beckman/Berkeley EASE, Type 1100, with digital output input translation, is being flown to Britain early in February to be exhibited privately by the Beckman/Berkeley agents in Great Britain, Winston Electronics, Ltd.

The computer will be set up and demonstrated on February 10-12 in Central London to those interested, who should communicate with Mr. Keith Laurence.—*Winston Electronics, Ltd., Shepperton, Middlesex.*

DRILLING EQUIPMENT CONTRACTORS

L. M. VAN MOPPES & SONS, LTD., announce the formation of Holemasters, Ltd., as a company to handle outright sale, hiring and contracting 'Diatube' diamond drilling equipment, for the benefit of the building, constructional engineering, and allied undertakings.

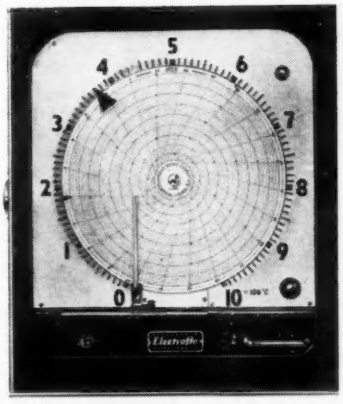
While Diatube drilling equipment has been known for some time, hiring and contracting arrangements are an entirely new departure, and it is felt that these will be of considerable help to architects, consulting engineers, contractors, and civil engineers, and any other concerns interested in problems relating to the cutting of holes or taking cores in reinforced concrete, granite, brick, hard ceramic tiles, etc.

The equipment enables the production of accurately-sized holes, which are cut cleanly and silently, with no percussion or vibration, and produced in entirely dust-free conditions. The use of this equipment offers many advantages, particularly in the cutting of clean holes in terrazzo, granolithic, and similar materials, when these are laid on concrete. Cutting can be carried out without lifting or causing damage to these materials.

No inconvenience

In occupied buildings the equipment is of particular interest, because its use does not cause any inconvenience to occupiers.

As Diatube cuts the exact hole diameter required, 'making-good' is wholly eliminated. The hole is ready for use immediately cutting has been completed, and holes may be drilled up to 12 in. diameter.—*Holemasters Ltd., Leicester Road, Basingstoke, Hampshire.*



Electroflo Meters new electronic potentiometer for registering low potential electrical values.

Trade cuttings

Romeike & Curtice, Ltd., press-cutting agency, now cover the trade and technical Press of the U.K.—Details from: *Trade & Technical Clippings Service, 447, Green Lanes, London, N.4.*

New electronic potentiometer

A NEW electronic potentiometer designed to register low potential electrical values from signal sources, such as thermocouples, resistance thermometers, flow meters, strain gauges, etc., has been made by Electroflo Meters Co., Ltd.

The potentiometer is available as a single point recorder; a recorder with multiple alarm switching; a controller-recorder with two-step or proportional action and as a recorder-converter with pneumatic transmission signal of 3-15 p.s.i. It is believed to be the simplest mechanism yet achieved in industrial potentiometer design, for the total motion is exercised through a single shaft which is mounted in ball races and the recording pen and indicating pointer as well as the control and multiple alarm switching, proportional sender, pneumatic converter and coding number are directly and positively related. Both the desired value indicator and the measured value pointer are readily observed from a distance.—*Electroflo Meters Co., Ltd., Abbey Road, Park Royal, N.W.10.*

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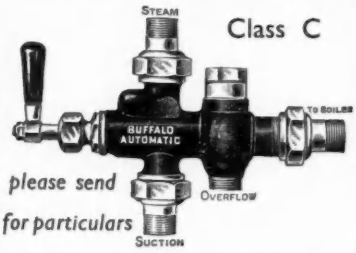

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APPOINTMENTS VACANT

EAST MIDLANDS GAS BOARD
ASSISTANT ENGINEER—TANNER STREET WORKS, NORTHAMPTON

APPLICATIONS are invited for the appointment of Assistant Engineer at the Tanner Street Works, Northampton. The appointment will be in Group A (£1,115/£1,235) of the National Salaries Table for Senior Gas Officers.

Applicants must have had considerable experience in the operation of continuous vertical and carburetted water gas plants, together with ancillary installations. This Works also has an oil gas plant but experience in this type of plant is not expected. The Works has a gas making capacity of just over 13 million cubic feet per day.

If required, a house will be made available on reasonable terms under the Board's Standard Form of Agreement.

The position is pensionable, and the successful applicant will be required to pass a medical examination.

Applications, stating age, qualifications and experience, together with the names and addresses of two referees, should reach the undersigned by not later than February 10, 1959.

A. GWYNNE DAVIES,
Secretary.

Beverley House,
University Road,
Leicester.
January 20, 1959.

WEST MIDLANDS GAS BOARD
WALSALL AND DISTRICT DIVISION

VACANCY FOR
ASSISTANT CHEMIST, WEST BROMWICH

CANDIDATES should have had experience routine chemical testing and be capable exercising control of purification plant. possession of a recognised qualification in chem would be an advantage.

The salary for the appointment, which is pensionable and subject to medical examination, will within APT. Grade 7 (£733-£813 per annum) of National Salary Scales for Gas Staffs.

Applications stating age, qualifications experience, together with the names of referees, should be addressed to Mr. F. Harr Divisional General Manager, West Midlands Board, Walsall Factory Estate, Tame Bridge, Bromwich Road, Walsall, **to reach him not later than February 9, 1959.**

J. SWAN,
Secretary to the Board

SCOTTISH GAS BOARD
GLASGOW AND WESTERN DIVISION

APPLICATIONS are invited for these positions

(a) Technical Assistant Dumbarton/Helensburgh district at Dumbarton Gas Works.

Applicants should be over 21 years of age and studying for a Higher National Certificate in Mechanical or Civil Engineering. They should have at least three years' working experience in a responsible technical capacity. Training will be given to enable them to operate modern coal gas carbonising and ancillary plant.

Facilities for further study are available under the Board's Education and Training Scheme.

The post, which is pensionable, is graded A.P.T. (Provincial 'A') £481 to £640 per annum, with placing therein according to qualifications and experience.

Mark Applications 'TA/DH.'

(b) Post in the Divisional Central Laboratory which covers both the Production and Utilisation Services of the Department.

Applicants should have specialised in analytical chemistry and have had experience in instrumental methods of analysis.

Candidates should be Associates of the Royal Institute of Chemistry or possess a degree with Chemistry as the principal subject.

The post, which is pensionable, will be remunerated within Grade A.P.T. 9 (Provincial 'A') £827 to £1,000 per annum, with placing therein according to qualifications and experience.

Mark Applications 'CL.'

The successful candidates will be required to undergo a medical examination.

State age and give particulars of education, training, qualifications and experience. Applications should be addressed to the **Personnel Officer, D.G.J., The Scottish Gas Board, 9, George Square, Glasgow, C.2,** not later than February 14, 1959.

CONTRACTS OPEN

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TENDERS are invited for the supply and erection of one 7,500 cu.ft./hour Roots type Exhauster with 1½ H.P. Diesel and alternative Electric Drive complete with Valves, Bye-pass and Connection to existing mains. Further particulars may be had on application to the Gas Engineer. Sealed tenders endorsed "Exhausting Plant" will be received by the undersigned up to but not later than 12 noon on March 31, 1959.

J. V. NOLAN,
Town Clerk & Secretary
to the Gas Undertaking,
Waterford Road,
Clonmel,
Co. Tipperary.

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